DCCUMENT RESUME

ED 033 863 SE 007 644

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TITLE Initiating a Science Reading Prcgram in a Ghetto High Schocl: Rcle of the Science Reading Consultant.
INSTITUTION Jersey City State Coll., N.J.
Pub Date [69]
Note 26p.

EDRS Price EDRS Price MF-$0.25 HC-$1.40
Descriptors *General Science, *Ghettcs, Grade 9, *Reading Difficulty, Reading Instruction, *Reading Research, Seccndary School Science
Identifiers New Jersey Bell Telephone Reading Project

Abstract

This is a repcrt of an effort tc improve ghettc children's reading in science classes. The writer worked as a consultant with ninth grade general science teachers. The teachers involved in this study used lesscns designed by the ccnsultant, as well as materials frcm ccmmercial publishers. The author reports that there was marked imprcvement in the attitudes, understandings, and acticns of all members of the Science Department since the inception cf the prcject. (BR)

ED033863

INITIATING A SCIENCE READING PROGRAM IN A GHETTO HIGH SCHOOL: ROLE OF THE SCIENCE READING CONSULTANT

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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SE 007 644

Can a teacher do a good job in the classroom when administrative interest in instructional activities is negligible and when the administration does little to curb the high rate of student absenteeism, cutting and hall disorder? How can our instruction be effective when many of the kids we teach come to class with the attitude "I've been passed before for doing nothing; so it'll happen again"? How do you get through to kids who "couldn't care less"? Can you expect us to teach efficiently without the right materials? How do you do a good job when your kids can't even read their texts? Isn't it too late to help these youth with their reading problems at this stage of the game? Wouldn't your contribution as a reading consultant be more meaningful in the elementary grades where you might show teachers how to teach their children to read so that they won't come to us semi-literate?

Questions of this type were flung at the writer during the first and second of a series of conferences with members of the Science Department in a ghetto secondary school in Newark, New Jersey. To the writer, one of a team of four professors employed by New Jersey Bell Telephone Company as reading consultants in the content areas, it was apparent that if any good was to come of the Bell Telephone Reading Project which aimed to improve the science-reading habits and attitudes of ninth grade general science students, top priority would have to be given to the modification and/or mitigation of negative and defeatist attitudes. But where does one begin? Initially by setting the stage for teachers to adopt a self-questioning attitude: Isn't it premature and self-defeating to write off inner-city high school students as irreversibly uneducable? If we do, aren't we really talking ourselves out of a job? Should we advocate the closing of ghetto secondary schools? Is our frustration in getting through to these to these kids a symptom of our own inadequacy? Who's unhappier, the kids or the teachers? What relevance does knowledge of the paramecium have for the adolescent who is "hooked" on dope? How important is the sex life of a frog to a fifteen year old girl recently impregnated by her

lover? Do we have a right to expect a predominantly black student population to "be all ears" when they are continually being exposed to content which doesn't "hit them" where they live? Who can say that the high absentee rate among students is unrelated to the unfulfilled needs these kids must experience in an unresponsive academic environment? Who can say with certainty that the hard-core truant can be enticed back to school when psycho-social problems relating to gambling, prostitution, and narcotics addiction are so prevalent in his "back yeard"?. We talk about humanizing teaching but how many periods have we spent "taking a back seat" and permitting the kids to be the stars teaching us and their classmates about the biological effects of pep pills, LSD, and heroin? About the relationship between hepatitis and the "needle"? We speak of student involvement in curriculum readjustments but what part have students had in the selection of course content? Is there a single element in the science program which stems from the student's verbalized interests and/or demands?

These questions hit hard and result in an agonizing examination and reappraisal of habitual ideas and attitudes. Teachers "open up" and become more willing to see the other side of the coin. They begin to recognize the desirability of instituting a reading project at the secondary school level. They realize that education is cut from the same cloth and that the elementary school teacher's problems are not very dissimilar from their own. Being specialists in science and possessing a reasonably good knowledge of their subject and some awareness of methods and techniques of presenting their material, they can concentrate, for the most part, on learning how to integrate the teaching of science with reading instruction. Elementary school teachers, were they to participate in our project, would, in addition to learning how to teach the fundamental reading abilities <u>from scratch</u>, also have to learn how to teach science, but not before they had increased their knowledge of the subject. (Consultation with many elementary school principals reveals that the two subjects which their teachers neglect for want of an adequate background of

knowledge are science and mathematics.) Instead of accentuating negative thoughts: (Oh, what's the use!) if parents and administration don't give a damn!), the teachers begin to develop a concern for doing something constructive about this "educational mess." They desire concrete suggestions which will help them to infuse in their students an interest in science. During one "brainstorming" session these suggestions emerged:

1. A system of prizes to encourage those students who try hard.
2. Workbooks which would serve to crystallize and reinforce students' daily learning. It was mentioned that no matter how interesting a science lesson, the students must take the responsibility of "nailing down" some of the highlights of the lesson.
3. A tutorial program to provide some private help to students who need and desire it.
4. Multiple texts to meet the needs of children functioning at different interest and reading levels.
5. Mimeographed lists of prefixes, suffixes and roots (those most used in science) to stimulate an interest in and an understanding of difficult words.
6. How-to demonstrations relating to the diagnosis and remediation of reading problems in science.
7. Science kits to further stimulate scientific curiosity and to provide a means for the pursuit of individual experiments.
8. Guest lecturers.
9. Student teachers.
10. A variety of audio visual aids.

As the last suggestion emerged, questions began to"fly." "Why don't they read the textbooks?" "What do you do to get them to read science materials?" A lecture discussion followed during which we talked about the causes of reading difficulties:

inadequate vocabulary, poor command of phonic and word recognition skills, poor comprehension, uninteresting materials, etc. One of the teachers suggested that science materials may be unrelated to their interests and experiences: "How are some of these students able to get the meaning of storm windows when they don't have them in their dwellings?" Another suggested that the reading of magazines like Popular Science, Popular Mechanics and Current Science might stimulate some of the reluctant readers to read. Another noted that since scientific writing has patterns of organization that require a type of reading that is different from that required in other subjects, students should be helped to develop flexibility in their reading habits. Another teacher said that one can't assume that when a youngster gives a beautifully phrased answer he understands what he's talking about. "They repeat phrases from the book which are not understood." Good questioning will enable a teacher to find out whether students are really in possession of knowledge that they understand.

Teachers like to be shown how reading "skills" and science content are taught concurrently. One approach is to select two or three students who have reading difficulties in science and to invite them to participate in a forty-five minute science session.

Using their class text, these students were asked to answer questions relating to the use of the table of contents, glossary, index, etc. They were then asked to read orally. Surprisingly, each of these ninth graders read a brief selection with a minimum of word recognition errors. I could not help but think that if these youngsters were typical of the ninth grade retarded reader population (I had requested youngsters whose reading difficulties were typical of the average reading performance) then the entire department and myself were underestimating their reading ability (I had been led to believe that most youngsters were reading below fifth grade). If on the other hand, these students were misidentified, then it would indicate that there was a need for helping teachers to determine criteria by which they could better differentiate between various types of reading difficulties.

Here is a transcription of a meeting designed to introduce teachers to an informal assessment of three students' reading and study habits:

Vince: I can't remember what I just read. My memory isn't good.

Consultant: Reread the passage. Notice at the top of each paragraph the print is larger and darker than the rest of the page. Why?

Vince: I think it's because these words are more important.

Robert: They give the main idea.

Consultant: Yes, and what do you get out of reading what's beneath the bold face print?

Jeffry: The details.

Consultant: Now, Vince, since you said you couldn't remember what you had read, what can you do to retain this information?

Vince: Read it over again.

Consultant: Anything else?

Jeffry: Take notes.

Robert: Study it over again.

Consultant: Jeffry, in the passage just read you came across the word preciptation. What clue is given in the text to assist you in pronouncing this word?

Jeffry: It's spelled in a different way.

Consultant: This is how you should pronounce the word. Notice it has five parts or syllables. You mispronounced the second syllable (sik). It is pronounced as the first part of sick. The sound of the vowel is the first sound you hear in the word "it." Do you know the meaning of this word?

Jeffry: No.

Consultant: Anyone? What can you do if you don't know the meaning of a word?

Jeffry: Ask the teacher.

Robert: Look it up in the dictionary.

Consultant: But is there another way? Well look at the sentence that precedes

the one in which this word appears. Now do you have a clue?

Jeffry: It has to do with rain and snow.

Consultant: Very good.

Mr. Nicholas (science teacher). What does it mean when the weatherman says the chance of preciptation for the day is ten per cent?

Jeffry: I don't know.

Mr. Nicholas: Anyone know? What does it mean if I say there is a zero chance of precipitation?

Jeffry: It won't rain. (Apparently these boys need help in understanding the meaning and derivation of per cent.)

Consultant: What does evaporate mean, Robert?

Robert: The water changes.

Consultant: Into what?

Robert: Into air.

Mr. Nicholas: That's not entirely right. (Failing to elicit a more precise answer, Mr. Nicholas supplied the correct response.)

Mrs. Lago (science chairlady): I think that Robert did rather well.

Mr. Armour: Yes, especially in view of the fact that the precise answer was not really in the text. You used your head to figure this out, Jeffry. (Mr. Nicholas acquiesed.)

Consultant: So it is possible to figure out the meaning of a word by putting two and two together. When we do this we are making use of context clues. In order to make sense of what we read we have to remember information contained in preceeding paragraphs. Robert, can you show us how to figure out the meaning of cycle by keeping in your mind information from the previous paragraph? Remember, that the water disappears when the sun shines on it for a period of time. Then what happens?

Robert: It evaporates, forms clouds, and then it rains and water forms in puddles.

Consultant: Then what happens?

Robert: It starts again.

Consultant: What word can we use to indicate that the same things reoccur or start again?

Robert: I don't know.

Mr. Nicholas: I'm drawing a circle on the board. (Mr. Nicholas then elicited from Robert the recurring succession of events and as Robert talked, illustrated them by tracing his finger around the circle to the starting point.) This is a cycle. What is a bicycle?

Robert: It hastwo wheels.

Mr. Nicholas: Cycle means wheel or circle. A knowledge of prefixes and roots can help you to build a good vocabulary.

Consultant: Boys, would you like to learn how to figure out the meanings of a word by studying prefixes, roots and suffixes?

All: Yes !

Consultant: Last week your teachers told me they thought I should give them a list of scientific roots. I've got this list and Mrs. Lago will probably mimeograph it. I will also give Mrs. Lago a book on the subject (Scientific Words: Their Structure and Meaning by W.E.Flood.) In college, one big difference between a good student and a poor one (both of whom may read well) is that the good student has a good study techniques. How do you study science?

Jeffry: I take notes.

Robert: I read carefully.

Vince: I read it over again.

Mr. Nicholas: How many of you have a place to study that's quiet?

Robert: The radio is always blasting and I can't concentrate.

Mr. Nicholas: Then what do you do?

Robert: I go to the library.

Consultant: That's a good idea. Would you fellows like to learn a good study technique? (All said they were interested) and I proceeded to explain Robinson's SQ3R technique - Survey, Question, Read, Recite and Review. Possible advantage of using each of these steps were elicited from both students and their teachers. Each step was demonstrated by student, teacher and/or consultant.

Mr. Bloom: This is all right when you have a few kids but this technique is not going to solve the problem of teaching in this school. The kids' attitude and motivation aren't what you think. They are not interested in studying.

Consultant: These kids may not do well because they've never learned appropriate study techniques. That's why they make the same mistakes. We may in part be able to change their attitudes toward doing their science homework if we take the time to explain the steps one should follow in doing an assignment.

Mr. Bloom: Maybe. But this kid doesn't ever bring his book to class.

Consultant: Maybe after today's session he will. Why should you bring your text to class every day Jeffry?

Jeffry: Because you have to review the work.

Consultant: I'll bet that you're going to bring your book every day because now you realize how important it is.

Jeffry: Yes, I promise.

Teachers: We'll look forward to hearing a good report from Mr. Bloom.

(Mr. Bloom appeared satisfied.)

Consultant: Do you think that what we learned today is important in your school work?

Boys: Yes. (They briefly indicated the benefits that they could derive from more meaningful reading and study habits.)

I'm of the opinion that the three students benefited from this session for two reasons: (1) They realized that it's within their power to utilize a study technique that could improve their academic achievement; (2) They appreciated the individualized nature of the session in which a professor and their teachers indicated by their attitude and questioning that they were genuinely interested in them as people and most concerned about finding ways to serve their needs.

SCIENCE READING INSTRUCTION

In response to the Science Department's request for a simple lesson plan to serve as a guide to help them to weave the teaching of reading skills with those of science content, I passed out mimeographed copies of the following lesson based on the reading of a weather unit in Richard's Topical Encyclopedia:

Aim: To learn that water vapor in the air is constantly renewed by evaporation from the air and condenses to form rain.

Motivation: (Developing reading readiness in order to both secure students' interest and to encourage them to think along the lines of the reading selection "Where the Rain Comes From").

There are some days when we are caught suddenly in the middle of a shower. Within minutes we are drenched if we don't seek shelter. Where did the rain come from? Why did it stay in the sky all the time with nothing to hold it up?

Vocabulary Development: (Clarifying the necessary concepts and vocabulary requisite for intelligent reading). The teacher having previewed the selection, chooses words

that require explanation and places these words on the blackboard in a context which cues the students into recognizing their meaning:

1. Water vapor or tiny drops of moisture began to form. (Definition clue).
2. Water from puddles evaporates into the air. (Experience clue).
3. The water condenses and changes from a gas into beads of water (Explanation clue).
4. The point at which this happens is called the condensation point. (Previous sentence clue).
5. Moisture gathers on the inside of a windowpane on a winter day when the glass is cold enough to chill the air near it to the dew point. (Description clue).
6. When the vapor is saturated, or the humidity or moisture is 100 per cent, then the slightest cooling would cause condensation. (Definition and Cause and Effect Clues).

The students are helped to pronounce the underlined words. Difficult words may be written phonetically. The teacher will aid the students to utilize various structural clues to figure out and retain meanings e. g. condense - condensation
vapor evaporate

Oral and/or Silent Reading: (Student and teacher directed).

1. How does water get into the air?
2. How may we increase the amount of water the air will hold?
3. When does the air reach its saturation point?
4. How do dust and electricity help produce rain?
5. What is the relative humidity?
6. How does humidity affect comfort?
7. What could be done to induce rain in an area which has had a dry spell? (Students may combine oral/and silent reading to find the answers to the above questions. During silent reading the teacher moves about offering assistance to those who need it).

Discussion: (This is related to the purpose for which the reading is done. Discussion should clarify mistaken ideas and difficult concepts).

Rereading: (This may be silent or/and oral. Among reasons usually given are to locate information omitted from discussion, to verify statements, to compare or contrast facts and to answer specific questions).

Application: (Knowledge gained from reading should be ulitized by demonstrating the presence of water vapor in the air, explaining the formation of clouds, constructing a rain gauge, etc.)

The Department found this guide useful as evidenced by their attempt to incorporate some of the ideas into their teaching. One teacher felt that contextual definitions were unnecessary since the children could obtain the definitions of words from their science text glossary. Other members of the department believed that many times students do not retain the glossary definition and for this reason they require a definition on the blackboard for easy reference. In addition, glossary definitions are needlessly complicated.

In learning about specific techniques of teaching a reading-oriented science lesson the science teachers found the Metropolitan School Study Council's "Five Steps to Reading Success in Science" useful. This five-step approach in science-reading involves readiness, concept development, silent reading, discussion (oral or written) and rereading (silent or oral). Lesson plans using each step are outlined for the teacher to enable him to help his pupils to master such skills as locating pertinent details, distinguishing between main ideas and supporting details, visualizing, following directions and drawing inferences. The chairlady of the Science Department questioned the desirability of emphasizing the silent reading phase when there are many difficult words and concepts which the students are not able to read and understand. She preferred to place emphasis on guided oral reading in order to mitigate the student's word recognition and word meaning difficulties.

At one meeting Mr. Nicholas remarked that fifty per cent of his students in Biology were unable to understand the text.

Mr. Nicholas: What do you do in this situation?

Consultant: There are several alternatives. One is to divide the class into two groups. While the faster or better reading group is engaged in silent reading to find the answers to certain key questions, the teacher can work with the other group, perhaps spending most of the time on giving background information, oral reading (student and teacher) and discussion. Before the class is divided, however, make sure that you've given some preliminary background information which insures that the faster group will read purposefully. In working with the slow group, spend much time helping students to analyze difficult words and concepts. Help them to break up words into syllables for easy recognition; show them how to use structural meaning clues (prefixes, suffixes and roots) and contexual aids to figure out words. Other lessons will include instruction in reading for the central idea, for details, to verify a point, etc. Appropriate study skills instruction will also be given. Obviously, since these activities are time consuming, it will not be possible for you to cover as much ground as you would like. So carefully select those indispensable concepts you want the kids to learn, orally summarizing and discussing them frequently to make the students' transition from speech to print easier. The satisfaction that the students experience from this approach may more than justify its use.

Mr. Bloom: But this is too time consuming.

Mr. Armour: When children have to listen to others read orally they learn to detect

errors as well as important clues for deriving information. So oral reading is a good idea.

Consultant: I realize that this activity is time consuming but the only way that you can help them is by giving them more time. That's the tragedy of ghetto youth; they get lost in the shuffle because no one has time to listen to them.

Mr. Nicholas: Frequently I find that a number of those unable to read the text can understand what I'm talking about when I provide background information. But that doesn't mean that when they read they would would understand the same thing in print.

Consultant: Yes. Being able to verbalize is no guarantee that one will be able to read what he can verbalize. Many retarded readers' listening skills are superior to their reading skills, which would account for your observation. But our problem is how to get these kids to improve their science-reading ability.

Mr. Nicholas: I have children who can't even sound out some of the words.

Consultant: These children would receive the intensive instruction I suggested. Not that this instruction will solve their problem in such a short period of time, but it may give them some hope and cause them to pay more attention in the science class. There is really little that we can do for those kids who are markedly deficient in word analysis skills outside of giving them tutorial instruction. Fortunately, most of your students possess the rudimentary basic word analysis skills to profit from the group activities I suggested earlier.

There are other alternatives to working out the problem that you raised earlier. You can rewrite a digest of each text unit for those children unable to read and understand the text. This

unit would be written at let's say a fifth grade level, (Your current text's readability level is about 12.0) and contain a minimum of technical phraseology. The concept load would be sharply reduced. Some words would be defined contextually and others would be briefly defined at the bottom of each page. Each concept would be interestingly developed using content with which young ghetto adolescents can identify.

Mr. Bloom: But we don't have time to rewrite.

Mrs. Lago: Do you think that Bell Telephone would subsidize a summer workshop project involving the rewriting of science materials?

Consultant: I think this idea has merit and I'll discuss it with Mr. Landis, the personnel representative. Getting back to Mr. Bloom's question, I don't believe that rewriting a four page unit is as time consuming as it may appear. Actually in going through this material you will be primarily concerned with essential ideas and content. You will eliminate extraneous or irrelevant material. You will amplify and exemplify compact statements - clarify vague explanations. The very process of distinguishing the essential from the non-essential material is a valuable exercise. Rewriting will involve substituting simpler words for the more difficult ones, reducing the number of restrictive clauses and inverted sentences, using more personal pronouns and concrete or colorful words but above all it will involve a more appealing and logical restructuring of content. (Examples of this type of writing are found in the Dimensions 99 science stories as well as those published by Science Research Associates). Why not try rewriting just one four page unit? See whether the results justify the effort?

Mr. Bloom: Perhaps.

Consultant: All of you must decide which of the alternatives presented is best for you. There's another alternative. I've been receiving up-to-date science texts from various publishers which are more readable than the text presently being used. These books have been placed in our professional library. I am hopeful that you will examine them to determine whether you would like to adopt any of these texts for class use. It may very well be that the best way to provide for individual differences within each class is to use multiple texts written at three different reading levels. Incidentally, I'd like you to look through the teacher edition of the science text in our professional library. They are "loaded" with useful suggestions on how to vitalize the teaching of science.

One hour after this discussion took place, Mr. Nicholas approached me and requested that I listen to one of his poorer reading students read from a biology text. It was apparent, upon hearing the young lady read, that the text was "over her head." "What do you do in this situation?" he asked. My response was that he would be doing more harm than good by insisting that she read from this text. It would be wiser to allow her to read an elementary text on a related subject or perhaps a trade book on some aspect of science in which she was genuinely interested.

USING NEW MATERIALS

Salesmen representing companies which featured materials which could possibly breathe new life into our science program were invited to demonstrate their "wares" before general science classes. On one such occasion Mr. Ken Moldow of New Dimensions in Education demonstrated before a ninth grade science class and members of the science department a supplementary science-reading oriented program. Mr. Moldow explained that

his kit, Dimensions 120, contained 120 different science stories, written on a fifth through eighth grade reading level; 2 L.P. records which stimulate a more dramatic presentation of ten of the stories; a filmstrip containing thirty-five frames in color and designed to capture student interest and whet their appetite for reading these stories; You-Can Experiment cards, each containing follow-up classroom and home experiments; Do-it Project cards accompanied by instructions and diagrams; twenty-five Learner Logs which contain practice exercises based on the contents of each card; a world map with sixty stickers to help students to develop map skills; and self checking answer wheels which the pupils manipulate in order to check their answers to the Learner Log exercises. The display case which houses all the equipment is made of plastic and is easy to carry.

Mr. Moldow immediately captured the classes' interest by projecting on the screen the picture of a boy who had fallen asleep in his science class. He then asked anyone to account for the boy's behavior. A number of students responded that since he was bored with his science work he dreams about making a trip through the human eye. "To find the answer to what he sees you'll have to read the story," Mr. Moldow teased. In a like manner, the salesman sparked an interest in several other stories. The students seemed genuinely interested in reading these stories. An hour later, the salesman entertained questions from members of the science department.

Mr. Armour: These stories (examining the kit) are interesting but the content is rather simple. I'm wondering as to its applicability for a ninth grade class.

Mr. Moldow: This kit is not necessarily meant to be used by all students. Perhaps the slower kids would find these stories more to their liking.

Consultant: I think Mr. Moldow suggested that the main purpose of Dimensions 120 is to stimulate an interest in wanting to read about a subject that a youngster might not ordinarily have wanted to read.

Mr. Armour: I guess so. There do seem to be some stories that are appropriate for bright kids.

Consultant: Would you like to use this set for a few days to determine its value for your kids?

Mr. Armour: Yes, I would but I'm wondering whether I'll be able to cover the term's work if I use these materials.

Mrs. Lago: I don't think you are "bound" to stick to the "curriculum." If our students are interested in this innovation, perhaps we should try it.

Mr. Nicholas: What provision does the program make for students who are poor readers?

Mr. Moldow: The subject matter is written at a level which many more students will be able to read than would be the case if they were to read from a typical text. Each card contains words which are defined for the student. The professional guide indicates different techniques for teaching pronunciation and testing comprehension.

Mr. Nicholas: But what about those kids who are unable to read these materials?

Mr. Moldow: Our program is not too helpful for those reading below the fifth grade. (Dimension 99 is intended to serve the needs of third through sixth graders).

Mr. Moldow left the Dimension 120 kit with us for a thirty-day period during which time several teachers used the kit with their general science classes. Unfortunately, the Department's final decision regarding the kit was to return it because they felt that the science content was too insubstantial. The student teachers, on the contrary, reported that the children enjoyed reading the stories.

Students and teachers were, however, more receptive to the high interest low-level vocabulary materials demonstrated and authored by Hy Ruchlis of Book-Lab, Inc. Mr. Rushlis believes that more responsibility should be placed upon the children's shoulders to do their own thinking about science learnings. Teachers, he believes,

should facilitate self-learning by acting as guides and by raising questions about the students' observations during experiments. Waiting to accept Mr. Ruchlis' challenge that any student can perform simple experiments and enjoy doing them were four ninth graders reading at a fifth grade leve. Ruchlis requested these students to read the first experiment in Mr. Wizard's Experiment in Science "Flying" bulletin. (The bulletin is written at a 4.0 readability level) After reading the selection, three students each bent down and tried to blow a card which had been placed between two books(of equal thickness) off the books. Try as they could, they were unsuccessful. Teachers and students were surprised. "Why can't you blow the card away?" asked Mr. Ruchlis. No one answered. Mr. Ruchlis asked a few more questions and then suggested that the group read the next experiment on "moving air." One adolescent, holding a piece of paper in front of his lips, blew against it and observed that the paper is pushed away and rises. Blowing over the top of the strip, the same thing happens. "Why?" queried Ruchlis. The students were puzzled but referred to the text to learn that the paper would rise only if the pressure were greater underneath the paper than above it. Apparently the moving air created a low pressure on top of the paper. Mr. Ruchlis skillfully led the students to generalize about what had actually prevented them from blowing the card off the books.

Next, Ruchlis distributed "Science Puzzle Pictures," a bulletin written by him. The students were requested to examine two pictures of the moon, one showing craters, the other mounds. When the student inverted the pictures they were surprised to find that where there were craters there were mounds and where there were mounds there were now craters. Mr. Ruchlis' objective was "to show that an observation of the same event may be different if the conditions of observation are different."

The students were next asked to infer how many stories there were in a pictured building, the top of which could not be seen. In this photograph it is possible to see the shadow of the building and consequently draw conclusions about its height.

The students and their teachers thoroughly enjoyed Mr. Ruchlis' demonstration. The Department unanimously decided to place an order for some of the materials. Our only reservation, and Mr. Ruchlis agreed, was that the materials don't make provision for the students to write in their own comments.

MEETING STUDENTS' INTERESTS

In order for a science program to be successful, students' perceptions and opinions should be utilized in restructuring the program. Students at Central were asked to rate their teachers on such matters as enthusiasm and competence in their subject, presentation of subject matter, classroom discipline, concern for students' needs and interests, and in addition they were requested to make suggestions regarding various improvements. It was hoped that the teachers of these students would "see themselves as the kids saw them" and perhaps institute changes which they believed were necessary. A Science Reading Interest Inventory was also administered to determine what aspects of science (many of which were not covered in their regular course of instruction) they would enjoy reading or learning about. Tallies were made of their responses and $400 worth of books and magazines were ordered in accordance with their desires. These materials would constitute a special science library. Students would have one free reading period a week during which time they could read about subjects that appealed to them. High on the list of selections were books on dope addiction, sex education and dating, and personal grooming. With the exception of books on narcotics, the readability level of these materials ranged from 2.5 through 9.0. Most of the books were written at about a fifth grade level. Because books such as The Junkie Priest by John D. Harris (1964 Pocket Books), The Mind Drugs by Margaret O'Hyde (1968 McGraw-Hill), Turned On by Dick Schaap (1968 New American Library), and The Panic in Needle Park by James Mills (1965 New American Library) are somewhat difficult for retarded readers, we decided to build up a background for the understanding of

these materials. On two occasions we invited three narcotics addicts to the school to talk about the causes, treatment, and prevention of drug addiction. One of the addicts, a thirty-year old who had been in jail for almost a fourth of her life spoke with such candor on the subject that the students who listened to her were visibly moved. Many expressed an interest in writing the New Jersey Drug and Abuse Regional Agency to learn more about the subject. One teacher who had witnessed the first session said that he had never seen kids ask more questions about a subject. "If only we could be as successful in motivating our students as were these addicts," he commented.

We planned to add to our library collection an additional $400 worth of books that paralleled units of science instruction. Thus there would be a balance between the students' choices and those of the "Establishment." The library would also contain magazines such as Current Science, Science Digest, Popular Science, Hot Rod, Ebony, Co-Ed, National Geographic, Galaxy, etc. It is unrealistic to assume that all students are going to read books or magazines dealing with science each time they visit their science library. For this reason, the library would contain some books and magazines related to teen-age concerns other than science: etiquette, fashions and hair styling: Seventeen (Triangle Publication), Personality Plus and Questions Teen-Agers Ask by Maureen Daly (Dodd Publishing Company); motorcycles, drag racing, slot car racing, karting: books written by Ed Radlauer (Bowmar Publishing Company); boxing, cooking, gangs: Better Boxing by Eddie La Fond (Ronald Press), Toughen Up by Frank Giles (G.P. Putnam and Sons), New Boys' and Girls' Cook Book by Betty Crocker (Golden Press), and Durango Street by Frank Bonham (D.P. Dutton and Company).

In order to stimulate student reading (science-related and un-science related) we might have to devise a system of rewards. Each student would receive a card with four circles. Every time the student read a book or a magazine in a different category,

he would color in a circle representing this category. Red signified a magazine unrelated to science; blue a magazine containing a story related to science; green a book related to science; yellow research-oriented activities. A student who had read material in all of these categories would receive a bonus of five extra points. A higher bonus would be "paid" to those who read exclusively about science-oriented subject matter: science fiction, experiments, science biography, current scientific achievement, etc.

TENTATIVE EVALUATION

There has been a marked improvement in the attitude, understandings and actions of all members of the Science Department since the inception of the Bell Telephone Reading Project in November, 1968. This statement is not intended to infer that prior to the initiation of the Project there was no evidence of fine teaching and/or receptivity to new ideas on the part of the staff.

The Science Department is more unified than it has ever been; in part, this is due to the many opportunities that it has had to discuss and take action on matters of mutual concern such as the ordering of suitable materials, the administration of a science reading inventory or an informal group reading inventory, the pros and cons of back-to-back scheduling, problems of student apathy, etc; in part, the Department is more unified because its members are beginning to think of themselves as part of a team - there is more cooperation and a greater sense of purposefulness. The teachers are beginning to believe that they have the ability and the tools to do a job that needs to be done. They are more confident, more hopeful, more enthusiastic, more willing to try new things, more willing to receive new ideas. In general, they have more incentive because I believe they have more positive feelings about themselves and their students.

The teachers have come to understand more clearly than ever before the necessity

for relating what they are teaching to the learning style of their students; they've come to recognize that their students will tune them out if they tend to lecture for any length of time; they have come to understand that the best description for a more effective teaching-learning atmosphere is less talk and more student involvement. The Department has a better understanding of the types of reading-study problems their students have and consequently it has a greater desire to take steps to correct the situation. Some members of the Department are very much interested in taking an intensive in-service course in reading because they feel that this is the only way that they can become proficient in identifying and treating reading difficulties. They would like Bell to sponsor such a course. More so than ever the Department realizes that it can play an important part in upgrading its students reading skills.

These science teachers have begun to question the sacredness of a fixed curriculum. Why shouldn't students have a say in deciding what they feel is important for them to learn in science? Why can't they do research or read about matters which have personal meaning for them whether or not the subject matter parallels the "prescribed" course work? Why can't the Department deviate from the "beaten path" and do its own thing? The teachers are becoming more aware that subject matter competency on their part is not going to win over their students. But a guidance and humanistically oriented approach probably will. Teaching must become more personal and individualized. Mr. Ferri and Mr. Zimmerman who were assigned to student teach can attest to the desirability of more frequent personal contacts with students and to the greater responsiveness they show in their science classes as a result of them.

The teachers have learned to exercise critical judgement in selection of reading and science kits. They listen carefully to what the salesmen of these products say and ask intelligent questions about the merits of their product. They much prefer to make a tentative decision on the basis of a classroom demonstration of a particular

kit so that they can observe and evaluate the students' reactions. Unless the teachers are certain on the basis of this demonstration that the kit is appropriate, they prefer to have the salesman leave the kit for a thirty-day trial period. During this time several teachers use the materials and report on their contents.

Several teachers have voiced a desire to write up study guides during a six-week summer period, Bell has given its approval to the idea and it remains for details to be worked out.

The very actions of the teachers in the Science Department would indicate that the Bell Project has proved its value. Mrs. Lago and Mr. Nicholas, in addition to developing a set of lesson plans, actually team-taught one lesson in the Light unit. Mr. Nicholas has given special reading instruction to several of his students in addition to attempting to diagnose his students' oral reading ability. He is of the opinion, as we all are, that the students' ability to read the text is not so bad as we had previously thought. Its more a question of motivation. Mr. Armour administered a group reading inventory to his general science classes in order to find out the number of students capable of reading the text. He has used the McGraw-Hill Battery and Bulb Kit to vitalize his teaching of a unit on electricity and also examined high interest low level vocabulary materials suitable for use with general science classes and decided to utilize some of these materials next September. Mr. Bloom has used a set of workbooks which he had ordered and found them to be most worthwhile in helping students to crystallize some of the information they had learned. He was the first to initiate a free reading science period. Mr. Small has helped to order science materials for our classroom library. He has determined his students' general reading ability by means of the Wide Range Reading Test and as a result of discovering such a wide range (2.0 - 15.0) has softened his hardline approach in grading his students. Mrs. Lago has attempted and succeeded in involving a greater number of students in lab-oriented activities and has been a driving force in activating student and faculty self-improvement.

The teachers report that, in general, their students have shown some improvement with regard to motivation. They appear more involved and less apathetic. No doubt this has resulted from improved teaching and from the students' recognition that their teachers are actively trying to make their subject more personal and stimulating. Perhaps in the Fall when back-to-back scheduling of science classes is instituted more students will be receiving instruction compatible with their learning style. As the science library continues to expand, (we expect to have more than 200 books and magazines) free reading and research-oriented activities will become more commonplace. More emphasis will be placed upon stimulating scientific curiosity and interest through laboratory participation. Miss Walsh will be experimenting with some new scientific equipment which she feels will generate a spirit of inquiry among her students.

THE JOB AHEAD

The foregoing evaluation submitted to Bell Telephone would appear to indicate that we were on the right track but that a great deal needs to be done. There is a big difference between observed or a verbalized attitudinal changes and those that carry over into teaching activities. What people say they believe in and what they say they ought to do are not necessary congruent with what they actually will do when they have the opportunity.

At the present time, the teachers are using texts which according to the Smog reading formula require a reading ability which is higher than that possessed by 85 per cent of the freshman class. Suggestions have been made regarding how this problem can be mitigated in part: Will the teachers follow through on them?

Presently the students' science-reading is woefully inadequate. Will teachers encourage wide reading of trade books in science-related areas or will they revert to their conventional procedure of giving the students a text and if they can't understand it "that's tough."

The teachers are cognizant that their students require special help with regard to understanding specialized vocabulary, concepts and organizational patterns of science materials. They are aware of the wide range of reading problems existing in each class. Will they integrate the teaching of reading with subject matter?

The teachers say that they see the advantage of personalized instruction. But to what extent will they actually humanize the teaching of science. To what extent will they allow their students to become the "stars"?

The teachers "know in their hearts" that to do a good teaching job home preparation is a must. There was little evidence that most of the science teachers were willing to do "extra" planning. Can a program succeed when teachers are reluctant to put in extra work? Can teachers hope to expect their students to do their homework when their teachers quibble about putting in extra time?

Can a program be successful which does not have the enthusiastic backing of parents and administration?

Whether the future of this project is a bright one or not will undoubtedly depend on the answers to these questions.